

Semi-Centennial of Greatest Inventions in the World's Warfare

On This Fiftieth Anniversary of the War Between the States It Is Found That the Inventive Genius of the American Mechanic Revolutionized the Methods of Modern Warfare—Modern Rapid-Fire Guns, Submarines, Iron-Clad Battleships, Torpedoes, Military Telegraphy, War Photography and Scores of Other Great Inventions Can Be Traced Directly to the American Civil War—Remarkable Record of the Ingenuity of the American People.

By FRANCIS TREVELYAN MILLER.

THIS is the fiftieth anniversary of the development of some of the most remarkable inventions in the world's history. A celebrated political economist said a few days ago: "There is one feature of the American Civil War on this semi-centennial that is being practically ignored. It is the fact that more great inventions and appliances have had a direct effect upon the rise and fall of nations were developed during those years than at any other time in history."

While these inventions to a large extent are for the purpose of war, they have become many instances of great benefactors of peace. Modern warfare and the peace of nations depend largely upon them to-day.

The crowds that stand before the bulletin board of this newspaper to-day, reading the latest dispatch from China or Tripoli, flashed around the world in the same hour in which it is happening, do not realize that this system of news dispatches received its first great test in the Civil War.

Modern telegraphy, until that time, was considered a somewhat visionary experiment, and there had been much difficulty in securing public confidence or financial backing. Several commercial enterprises were struggling for existence, and the Atlantic cable had become one of the greatest engineering feats of the age, but the telegraph had not been brought into general utility until the people witnessed its wonders on the bulletin boards of its newspapers.

The electrified wire was at the same time taking its first great part in the making and unmaking of nations as the battle front. It is impossible even after a half-century to recall the battles that were lost or won by the telegraph instrument in the Civil War. It proved to be not only a great soldier, but a great general.

Battles lost and won by electricity. A military authority says that the success of the great Army of the Potomac was to a large extent due to the telegraph, which connected its various headquarters like nerves in one body, allowing them to move with simultaneous action. Its early demonstrations became so successful that "battery wagons" and telegraphers were sent out with nearly every army corps, laying wires on convenient tree limbs or on the ground in the rear of marching armies to be able to flash back the call for reinforcements or the news of victory or disaster in a moment's time.

Telegraphy became so important a factor in the war that secret service men were sent in pursuit to cut down the wires of the opposing army and sever their connections. Wire-tappers also sprang into existence, and many secret and false messages were "tapped" onto the wires to the utter bewilderment of the armies.

Messages That Saved Great Armies. Washington and Richmond became great throbbing telegraphic hearts, in which governments were being saved by their prompt orders flashed to the battle-front by electricity. Lincoln spent much of his time in the telegraph instrument, listening to the word and expression from the operator.

One of the first great telegraph stations was at City Point, Va., during 1862. The operator, with his instruments, was seated on a hard-tack box under a fly-tent, with his "relay" stationed on another box. With this instrument Grant was in instant touch with four different armies, over a quarter million men, and had control of an area of 750,000 square miles.

During the first years of the war, a heavy, stiff wire was used, but this was cumbersome, and an inventor came forward with a flexible insulated wire, which enabled the construction corps to place the wire back in the back of a wagon and to roll off at great speed.

It frequently astonished the commander to find that after a rapid and long march the telegraph corps was on his heels. Even before the camp was established the operator was

Siebert photographed the battle scenes around Charleston, S. C. Cook, of Charleston, and Edwards, of New Orleans, secured Confederate scenes in their localities.

The difficulties these men overcame are a great story in themselves. The scenes in those days was that known as "wet-plate" and it required almost exposure of five minutes. The plate had to be developed within the succeeding five minutes or the view was lost. The camera was a huge box, large enough to hold a glass plate 8 by 10 inches. The "wet-plate" was glass, and had to be "sensitized" on the field just before using. Huge demijohns of chemicals for "sensitizing" and developing had to be carried onto the battlefields, and a light proof tent was necessary to develop the pictures.

The Federal photographers had to secure their chemicals from New York. The Confederates met with great trouble; their chemicals must be obtained from the same firm and smuggled through the Federal lines. This was done by "orders to trade," some of which are still in existence, bearing the signature of Abraham Lincoln, but instead of the true nature of the chemicals appears the word "quinine."

The photographers placed their lives in great peril to secure the remarkable views. Brady drew the fire of an army corps at Fredericksburg. The huge cameras looked like cannon to the Confederates, and they frequently targeted the fire upon the instruments. Brady escaped without injury, confirming the belief of his associates that he bore a charmed life.

Despite the tremendous work that the first war photographers wrought on the Confederates, Brady died in poverty in New York hospital ward 1895. His priceless work even at that time was lost as far as the public was concerned, and he did not even know where the negatives were.

Celebration of the Modern Ironclad Next Year. Recently naval circles have celebrated the anniversary of the modern ironclad, which is fifty years old this year. The modern 7,000-ton Dreadnought is but the outgrowth of these first ironclads of the Civil War, an invention that has done more to revolutionize the world's navies than any other single agent, excepting steam power.

At the outbreak of the Civil War the warships of the nations were not much different, in essential features, than the old war galleys of the Greeks and the Romans. The first attempt had been made to protect the ships against the penetration of the foe's cannon balls.

To-day the modern fighting machine is a shell of steel and is propelled by the crude turbine engine. Its speed by turbine engine is 20 to 25 miles per hour. The upper deck itself is one vast sheet of steel, which protects the ships from penetrating the vital parts of the engine, the magazines and powder magazines are stored in action, not a single man is in view. It is peering through range-finders in a steel-clad barbettes or conning tower.

Days before the Civil War, when a cannon ball struck the mast yard, the battle was practically ended, for the ship's motive power was gone. To-day, with the latest skeleton masts, more than 75 per cent of the ship's power forming the mast can be shot away and still the mast stands.

Anniversary of the Torpedo Boat. The little low-lying, speeding, torpedo boat that lies calmly beside the monster battleship, had its birth in the Civil War. The submarine, that has just come to the surface from a trip to the bottom of the sea, where it has been for several hours, was given its first practical demonstration fifty years ago. The different classes of submarine mines which line the harbors of the world today had their birth during the Civil War.

It is exactly fifty years ago this winter that John M. Brooks, of the Confederate navy, conceived the idea of placing the captured hull of the ironclad Merrimack with afloat in the water line. Then a section was built amidships 170 feet long and covered with iron plates about four inches thick. When the vessel was launched it floated like a house on the water. The Merrimack, ironclad, sloped at an angle of forty degrees, and at regular intervals port-holes were made for ten guns.

Semi-Centennial of the Monitor in Warfare. This was the embryo battleship as we see it to-day. Before the Merrimack or Virginia, as she is known in the South, sank the Federal vessels in Hampton Roads fifty years ago this month, the news of her building reached the North. Here, too, necessarily became the mother of another invention—the Monitor. Ericsson built his famous "cheese box on a raft" in 100 days, following the principle discovered by Theodore Ruggles Timby for a revolving turret.

Ericsson's Monitor became the embryo modern monitor, and the latter still retains many of the features of the little ship of fifty years ago. Since the Monitor sank in a gale off the coast, the true use of such a vessel has been discovered—as harbor defender—and the Monitor attempt long sea trips since the disaster to Ericsson's little craft.

Iron Ram Is Just Fifty Years Old. To-day every modern battleship has a steel prow extending for a distance under the water, with which to ram the enemy's ship. Before the Civil War the ram, as these prows are called, was not used. Charles Elliott, a Pennsylvanian, when Iron became an important part of battleships, conceived the idea and manufactured a fleet of iron ram steamers, whose motive power was either a side wheel or stern wheel, and equipped them with his new ram.

The first engagement on the Mississippi, in which the little gunboats sturdily advanced against the foe's ships and rammed them with their iron prows, sending several to the bottom, proved the practicability of the ram.

Submarine Mine Is Product of the Civil War. Every important harbor in the world to-day is mined with high explosives. Though the idea of harbor mining was not conceived in the Civil War—David Bushnell during the Revolution made many attempts to blow up the British ships at New York, but the vain—its practicability and its science was proven during the Civil War.

The first floating mine—now considered too dangerous to its handlers, and never used except in extreme cases—was attempted in the Potomac River fifty years ago, this last July, when the United States ship Pawnee lay at anchor.

When the "infernal machine" was picked from the water it was found to consist of two cylindrical tanks suspended from two oil casks, and was designed to float with the current against the side of the ship, where a time fuse was to explode it.

large charge of powder and tear a hole in the ship's bottom, sending it to the bottom.

The metal tanks were about five feet long, and loaded with gunpowder. The casks, or buoys, were connected by about twenty feet of rope. The fuses ran from boxes on top of the casks, through gutta percha tubes into the powder in the tanks.

First Vessel Sunk by Gunpowder Mine. The first vessel to sink by means of a submarine mine was the Federal vessel Cairo, in the Yazoo River, fifty years ago the 12th of next December. The torpedo was the type now known as a "contact mine," and was practically the same as now used, except that it was made of glass.

Captain Isaac N. Brown, in command of the defense of the river, conceived the idea, but he had no proper material. He obtained several five-sallon demijohns, which he loaded with gunpowder, and secured five pounds to each mine. Cables were stretched across the river from bank to shore. Artillery friction primers were attached to the cable and demijohn to explode the mines when a vessel "picked up" the cable and pushed it aside.

His plan worked perfectly when the Cairo came steaming upstream. The vessel's prow picked up the cable and instantly two dull reports sounded, one under the bow and another amidships. Within twelve minutes Brown's home-made submarine mine had sent the gunboat to the bottom.

Have Caused by Ingenious Devices. When Farragut ran the forts at Mobile Bay he found the embryo modern contact mine. The Confederates had lined the channel with these new devices in the form of beer barrels, loaded with powder, which was exploded by contact with tubes of fulminate, a highly explosive acid. The other types were large tin cones with percussion caps in the top, against which a vessel rubbing would explode.

The charge, Farragut's ship, the Tennessee, got out of the passage marked with buoys and rubbed against one of the mines. She careened and sank within a minute.

Torpedoes and submarine mines blew up more ships and men during the Civil War than the loss by all the modern naval warfare. The total number of ships destroyed by these agents of destruction was twenty-eight, while hundreds of men were killed.

Deadliest of Monsters Now Has Its Birthday. The modern Whitehead torpedo—the deadliest and most subtle engine of modern warfare—is the outgrowth of the crude torpedoes of the Civil War, though the latter were not self-propelled. The Whitehead has almost human intelligence. While the sixteen-foot steel, cigar-shaped monster is on board it is practically harmless, it is only when it is striking the water from the torpedo boat, that its destructive is unlocked automatically by an ingenious contrivance, so that by the time it reaches the end of its run, which is usually a mile at the rate of 28 knots an hour, it is ready to explode.

Its "war-ner" contains about 200 pounds of gun cotton, one of the deadliest explosives known, and explodes instantly on contact with the hull of the enemy's vessel. If by chance it is deflected from its intended course, mechanical contrivances bring it back, and it will explode on the hull of the vessel.

The war was over before another torpedo was created, but the "H. L. Huntley" had given another terror to the world's navies. For many years the submarine was practical and effective.

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tion, built the famous Turtle, which proved impractical. Many other attempts have been made. The submarine of the War was marked with tragedy and admirable courage.

One of the first submarines was Confederate "H. L. Huntley," named after its inventor. She was a cigar-shaped vessel about thirty-five feet long, and could dive and be propelled under water, and also rise to the surface under her own power. On the sides were two fins, and at the stern was a propeller.

The motive power was furnished by the crew turning a crank connected with the propeller shaft. From the nose of the craft a thirty-foot spar with a torpedo, could be projected and controlled from the inside when the vessel was submerged.

First Trip of Vessel Under Water. The first trip took place in Mobile Bay, and her actions showed that at last a submarine had been constructed. One day the crew of seven took her for another trial. She gracefully sank from sight, but failed to reappear for many hours. When she was raised the crew was found huddled under the hatch—dead.

The horror of this catastrophe did not prevent Lieutenant John A. Payne from volunteering to attack the Federal blockade with the submarine. He easily found a crew. On the way out the crew turned a crank connected with the propeller shaft. From the nose of the craft a thirty-foot spar with a torpedo, could be projected and controlled from the inside when the vessel was submerged.

The South was beginning to lose faith in the submarine when the first war came and took her in hand. Under the control of its creator, the boat made several spectacular dives and manoeuvres while on the way out to the blockade.

On one of her dives she remained below water for ten minutes, and once reappeared when the spectators began to think she was lost. Consequently, when she next dove and did not appear within ten minutes the sightseers believed all was well. But when an hour had passed and the "H. L. Huntley" still remained on the sea bottom, they gave her up as lost. This time they were right, for the vessel and the body of its inventor were not recovered until a week later. As in the previous cases, the dead men huddled around the hatches or manholes.

But the fate of the inventor and his crew did not dampen the ardor of a few volunteers. They set out again, but ran afoul of an anchor chain on a receiving ship and went to the bottom. The body, too, was added to the toll of tragedies.

Great Tragedies of Great Inventions. Lieutenant George E. Dixon, of Alabama, saw the folly of his predecessors and determined to go straight to the heart of the matter. Disporting in the harbor for the benefit of the spectators, on the night of February 17, 1864, Dixon and his crew entered the harbor, and the vessel moved silently out to sea. Without mishap she kept clear of the shore. For many years the submarine was practical and effective.

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boom swung forward from the bow. The Searchlight Is the Result of War. Necessity was the mother of the invention of the searchlight. The little torpedo boats, the "Davids," made it imperative that the water surrounding a ship be illuminated at night. Ordinarily ship's lanterns were useless, so the inventors turned to the new calcium light, which was the subject of much comment in the commercial world.

After the attack on the "New Ironclads" the naval authorities adopted the calcium light on this vessel, placing large and strong reflectors behind the light to cast the rays for a great distance over the sea. While these lights were burning it was practically impossible for the "Davids" to attack unseen.

During the bombardment of Fort Sumter, in Charleston harbor, in 1862 and 1863, the "New Ironclads" at night used the lights and Major General Gilmore adopted them in his land siege of Fort Wagner. Gilmore placed the lights on Cummings' Point, and when they were lighted the whole harbor was as light as day.

A Confederate soldier, who was in Fort Sumter during the bombardment, says: "I read by the light of the largest type of a newspaper (he was three-quarters of a mile away from Cummings' Point) the sentinels on the walls were dazed and annoyed by it. The appearance of the light, thrown upon the battered walls and arches of Fort Sumter, was always striking and beautiful."

This was the first use of the modern searchlight on a larger scale. To-day the lighthouses on the coast of the nations use these lights to show the mariner the way to a safe port, armies use them in night manoeuvres, and fire departments of large cities use them to bathe the burning building in light to show the fireman where he can best attack the flames.

Modern Rapid-Fire Guns in Warfare. There are many radical inventions of this anniversary. Before the war cannon were not very effective, though Napoleon placed much of his dependence upon artillery in battle. The idea of modern rapid-fire guns began in the Civil War.

To-day there are cannon that will fire a shell weighing as much as an ordinary automobile for a distance of twenty-one miles. The cost of a single discharge from this mammoth cannon is nearly equal to the cost of an automobile.

The modern coast defense does away with the historic entrenchments of former wars. To-day a gun magically rises from a moment from a pit, fires its missile and instantly sinks out of sight and range, where the modern mountain battery can be disassembled and packed on mule's backs to be carried over rough mountain trails. Its reassembly, in expert hands, occupies but a few moments.

The modern rapid-fire and machine guns are terrible death-dealers. The "Gatling" gun, a rapid-fire gun, a rapid-fire gun, weighing only eighteen pounds, and operated from a tripod rest, can fire high-power, small-calibre bullets at the rate of 300 a minute. With this gun ten soldiers could kill 3,000 men each, six shots to each death, in ten minutes.

The Maxim machine gun can fire 700 bullets a minute, while the Gatling gun, equipped with an electric motor, will discharge 1,800 bullets a minute, or at a range of one mile it will gnaw off a foot-thick pine post in seven minutes.

Gatling Gun Is Just Fifty Years Old. So terrible was the effect of gunfire in the Russo-Japanese War, in which men were found with seventy bullet wounds in a body, that the surgeons invented a new name, meaning "whole body honey-combed with gun wounds." This is one of the horrible facts that cause nations to hesitate before entering into war at the present day.

The Gatling gun had its birth in the Civil War. Dr. Gatling, of Indianapolis, conceived the idea. The Confederates had a rapid-fire gun, which was so light that it could be carried under a man's arm. It was called the "Schoolfield" rapid-fire. It was as large as a man's coat sleeve and about five feet long. It carried a half-weighting a pound, and could fire at the rate of one hundred and forty times a minute.

Modern Revolver Is Observing Its Semi-Centennial. The modern revolver is another product of the American Civil War. Samuel Colt, of Hartford, Conn., became interested in firearms while at sea, and devoted himself to perfecting a revolving cylinder pistol. Until the coming of the Civil War people were satisfied with a single-shot pistol, not having occasion to use an instrument that would fire five or more times without reloading.

Even during the first years of the

war the single-shot pistol was used almost altogether. But the revolver soon proved its worth, and became adopted into the Federal armies. Its first introduction into battle caused great astonishment among the Confederates.

"What kind of a gun," exclaimed a soldier, "is that you load on Monday and fire the rest of the week?"

To-day there are automatic pistols that will fire a continuous stream of bullets when the trigger is held, until the bullets come forth at a terrific speed. Recently Hiram Maxim, the son of the inventor of the Maxim gun, has perfected one of the deadliest contrivances known; it is a "silencer." It takes the "noise" out of the revolver. When one of these automatic pistols, equipped with a silencer and using smokeless powder, gets in operation, the victim is killed almost without the unseen, and unheard breath of death in a fraction of a minute.

Signal Service Is Result of the Civil War. The modern signal service is a development from the American Civil War. The equipment of a modern signal corps consists of flags for "wig-wagging," torches to be used in the dark, rockets of various colors for long-distance signaling, the heliograph, a device for flashing the rays of the sun from a mirror in series of flashes representing words, and the signal service telephone and telegraph.

Major Meyers, a surgeon of the United States Army, was stationed in the West during the Navajo Indian insurrection. He frequently witnessed the Indians signaling to one another for considerable distances with their lances. From this he developed the flag system and perfected it, against opposition and skepticism, until its utility was proven in the American Civil War. At night, when the flags could not be seen, torches and rockets were used.

The Confederates quickly realized the value of such a contrivance, and developed a system of signaling over the land. Word came that Confederates were heading toward the fort at Allatoona. A dramatic signal service incident occurred in October, 1864. Sherman occupied Atlanta, Ga., and a reserve depot of supplies, where 3,000,000 rations were stored, was located at Allatoona. Word came that Confederates were heading toward the fort at Allatoona. A dramatic signal service incident occurred in October, 1864. Sherman occupied Atlanta, Ga., and a reserve depot of supplies, where 3,000,000 rations were stored, was located at Allatoona. Word came that Confederates were heading toward the fort at Allatoona. A dramatic signal service incident occurred in October, 1864. Sherman occupied Atlanta, Ga., and a reserve depot of supplies, where 3,000,000 rations were stored, was located at Allatoona. Word came that Confederates were heading toward the fort at Allatoona. 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